Remarks

Claims 1-18 and 20-33 are pending in the present application.

Response to Rejection of Claims

Claim 1

Claim 1 is directed to a mass produced absorbent article. The absorbent article comprises an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image. The image includes at least one ink having the color of one of cyan, magenta, yellow and black. The image is printed in a non-contact manner on at least a portion of the one component by ink jets at a resolution of about 100 dpi with the component moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm). Any area in the image having a cyan colored ink applied at maximum threshold thereto has a coverage area ratio of cyan colored ink of at least about 3%, any area in the image having a magenta colored ink applied at maximum threshold thereto has a coverage area ratio of magenta colored ink of at least about 5%, any area in the image having a yellow colored ink applied at maximum threshold thereto has a coverage area ratio of yellowed colored ink of at least about 6%, and any area in the image having a black colored ink applied at maximum threshold thereto has a coverage area ratio of black colored ink of at least about 6%.

As mentioned in the specification, the recited article has an image that is darker (i.e., has more vibrant color) when the image is applied at high line speeds (e.g., 100 fpm or greater) even though the output of the print heads is set to dispense an unconventionally low quantity of ink (100 dots per inch). In

other words, the image on the recited article is more vibrant, brighter, and stands out better visually than those of the prior art even though it is formed at a high line speed and with less ink. See page 22, paragraph [0050] of applicants' specification. At least to the inventors, this was counterintuitive and a surprising result, the intuitive solution to increasing the line speed being to increase the ink output to keep up with the faster moving article.

Claim 1 is submitted to be nonobvious in view of and patentable over the references of record, and in particular, U.S. Patent No. 5,503,076 (Yeo) in view of U.S. Patent No. 6,096,412 (McFarland et al.), in that whether considered alone or in combination the references fail to show or suggest an absorbent article comprising an image printed in a non-contact manner on at least a portion of the one component by ink jets at a resolution of about 100 dpi with the component moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm).

Yeo (with particular reference to Figs. 1 and 2 thereof), discloses a multi-color printed nonwoven web laminate 10 having a fibrous nonwoven facing layer 12, a substrate layer 14 and a plurality of adhesive-inks 16. The adhesive inks 16 adhesively bond the facing layer 12 to the substrate layer 14, and impart a multi-color pattern which is visible through the nonwoven facing layer 12. Yeo further discloses that flexographic and ink-jet printing can be used to apply the adhesive inks 16. However, as noted in the final Office action, Yeo fails to teach or suggest the ink is applied at a resolution of about 100 dots per inch (dpi) as recited in claim 1. In fact, Yeo is also completely silent regarding the number of dpi used to apply the adhesive ink to the article.

McFarland et al. disclose a disposable paper product comprising a fibrous sheet (e.g., paper towels, facial tissue, bath tissue, napkins, cotton pads) having an image thereon. The ink used to form the image on the sheet is tough so that it resists being rubbed off. The ink can be applied to the fibrous sheet using various printing processes including lithography, letterpress, ink jet printing, gravure, screen printing, intaglio, and flexography. See column 17, lines 37-44. However, McFarland et al. fail to disclose or otherwise even suggest the resolution (i.e., the dpi) that should be used to apply ink to the fibrous sheet. Accordingly, McFarland et al. fail to teach or suggest an absorbent article comprising an image printed in a non-contact manner on at least a portion of the one component by ink jets at a resolution of about 100 dpi as recited in claim 1.

Because Yeo and McFarland et al. each fail individually to teach or suggest an absorbent article comprising an image that was printed in a non-contact manner on at least a portion of the one component by ink jets at a resolution of about 100 dpi, a combination of Yeo and McFarland et al. also fails to teach or suggest such a feature.

In addition, there is no teaching or suggestion found in either of these references or in the knowledge of those skilled in the art that would motivate one skilled in the art to modify Yeo and/or McFarland et al. to provide the recited image having a resolution of about 100 dpi.

As set forth in the attached Declaration, absorbent articles such as diapers and training pants are typically manufactured in a line process in which the various components of the article are assembled together at high speeds such as 100 feet per minute and more often about 1,200 feet per minute or more. Prior to the present invention, due in part to print head

limitations, graphic images that appear on such articles were applied by ink jet printing in an off-line process in which the graphic was imprinted on a film or non-woven web off-line, at lower speeds and over multiple passes of the web past the print head. The printed web was subsequently introduced to the manufacturing line at the higher line speed. The resolution of such images was about 300 dpi to about 600 dpi or even higher.

The quality of an image produced by a drop on demand ink jet printer has long been thought to be a function of the resolution of the image, i.e., a certain area of coverage of the substrate by the ink. The image resolution is typically defined in terms of the surface area of the web covered by a given amount of ink, and more particularly the ink dot density which is commonly given as dots-per-inch (dpi). A greater dpi has thus been associated with a greater resolution, and hence an increased quality ink jet image on the web. For example, the reference text submitted with the Declaration notes that conventional printing is typically performed at a resolution of 254-770 dpi, and for textile printing the resolution should be about 720 dpi. McFarland et al., which is cited in the final Office action, specifically teaches that "[t]he higher color density of the ink, the greater the intensity or strength of the color." See col. 19, lines 3-5. This reflects the conventional thinking of those skilled in the art prior to the present invention that the more ink that is applied to the article the greater the quality of the image.

The problem to be addressed by the inventors was to print at higher speeds that were available in off-line printing processes, while maintaining or increasing the resolution of the image printed on the web. Achieving this would allow the web to printed on the main assembly line, i.e., at line speed, thereby reducing the number of processing steps, increased flexibility

in changing graphics during manufacturing, and providing other manufacturing efficiencies and cost savings. The teachings known to those skilled in the art at the time of the invention dictated that to maintain the image quality of the graphic at the desired higher line speeds, the resolution of the graphic image on the web would have to at least stay the same (e.g., 300 to 600 dpi), meaning that the print head would have to output more ink as the line speed increased. However, during experiments conducted by the inventors, the graphic produced at these dpi (using faster print-head output and more ink) and higher line speed rates was blurred, or smeared.

Also during these experiments, the inventors increased the line speed (at which the printing occurred) even further, thus exceeding the ink delivery rate capabilities of the print head to see just how high of a line speed the print head could be used with. Exceeding the capabilities of the print head certainly is not a solution that would have been obvious to one skilled in the art. Indeed, this resulted in the image resolution dropping substantially below 300 dpi. Unexpectedly, however, the quality of the image was as good as, or better than, images previously produced at 300-600 dpi and slower line speeds and certainly better than images produced at 300-600 dpi at the higher line speeds.

As a result of their experimentation, the inventors determined that high quality images could be produced on absorbent articles moving at line speeds of 30.5 meters per minute (100 feet per minute) or greater using ink jet printing with a resolution of about 100 dots per inch (dpi). Such a result was unexpected in view of the previously common belief that increasing line speeds required a more rapid ink delivery rate (relative to the line speed) to the web, not a lower rate. and other manufacturing efficiencies.

The position taken by the Office in the final Office action is two-fold. First, as set forth at item 1 on page 2 of the final Office action, the Office takes the position that it would have been obvious to modify Yeo and/or McFarland et al. to have the recited image at 100 dpi because the recited resolution in an optimization of a result-effective variable. However, the prior art, including McFarland et al., specifically teach that increasing the resolution of the image increases the strength and intensity of the image. That is, the result of increasing the variable (i.e., the dpi) is an increased image strength and color intensity. The image recited in claim 1 as having a resolution of 100 dpi, however, is thus contrary and counterintuitive because it goes against the commonly understood relationship between resolution and image quality.

The Office, at page 3, item 2 of the final Office action, also takes the position that applicants must show and explain how the recited differences are unexpected and unobvious over the teaching of the prior art, and that any differences are of both statistical and practical significance. As discussed previously herein and the attached declaration, the recited image having a resolution of 100 dpi unexpectedly provides the desired image quality that was heretofore achieved only at higher resolutions and lower line speeds. The Declaration and supporting reference text provide evidence that the recited reduced resolution, at higher line speeds, is counterintuitive and contrary to the teachings of the prior art and the knowledge of those skilled in the art at the time of the present invention.

Moreover, applicants' specification provides both statistical and practical significance of applicants' claimed invention. For example, on page 3, paragraph [0007], applicants explain that using more ink drives up the costs of article. By

using less ink, applicants claimed article costs less, which is a practical significance, without compromising quality. In addition, applicants' claimed invention also allows the web on which the image is printed to be fed at high line speeds (i.e., 100 fpm). Thus, the image can be printed during the assembly of the article instead of in a separate, off-line printing process. In addition, at page 20, paragraph [0047] through page 28, paragraph [0057], applicants provide colorimetry data resulting from experiments conducted by the inventors to illustrate the statistical significance of printing the image at a resolution of 100 dpi at higher line speeds. As attested to in the attached Declaration, these results are not just different, but are truly unexpected.

For all of the above reasons, claim 1 is submitted to be non-obvious in view of and patentable over the references of record including Yeo in combination with McFarland et al.

Claims 2-18 depend either directly or indirectly from claim 1 and are submitted to be patentable over the references of record for at least the same reasons as claim 1.

Claims 11 and 12

Claim 11, which depends indirectly from claim 1, further recites that the image includes multiple separable design elements, none of the design elements being smaller than about 0.64 centimeters (0.25 inches) in height. Claim 12 depends from claim 11 and further recites that one of the design elements constitutes a focal design element, the height of the focal design element being at least about 1.91 centimeters (0.75 inches).

Neither Yeo nor McFarland et al. disclose the dimension of a design element, nor would it would have been obvious to one of ordinary skill in the art to modify Yeo or McFarland et al. on

the basis that discovering the optimum value of a result effective variable involves only routine skill in the art. See page 6 of the Office action citing *In re Boesch and Slaney*.

Such a position appears to be the very position rejected by the court in *In re Antonie* 195 USPQ 6 (CCPA 1977). In particular, the court noted that an assertion that it would always be obvious to one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system is improper "if there is no evidence in the record that the prior art recognized that particular parameter affected the result. *Id.* at 8 (emphasis added). Thus, the court made it clear that the recognition of a particular parameter as a result-effective variable must come from the cited reference.

In this case, neither Yeo nor McFarland et al. teach that the dimension of the design element is a result-effective variable.

For these additional reasons, claims 11 and 12 are further submitted to be non-obvious and patentable over the references of record.

Claim 20

Claim 20 is directed to a mass produced absorbent article comprising an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image including at least one process color ink, the image being printed in a non-contact manner on at least a portion of said one component by ink jets, the image including at least one separable design element being outlined in one selected color and being free of said selected color as shading in an interior of the design element, the

design element having a height of no less than about 0.64 centimeters (0.25 inch).

Claim 20 is submitted to be non-obvious in view of and patentable over the references of record, and in particular Yeo in view of McFarland et al., for reasons similar to those set forth above in connection with claims 11 and 12. That is, whether considered alone or in combination the references fail to show or suggest an absorbent article comprising a design element having a height of no less than about 0.64 centimeters (0.25 inch). In particular, neither Yeo nor McFarland et al. teach that the dimension of the design element is a result-effective variable. As such, one skilled in the art would not have found it obvious to modify Yeo or McFarland et al. in the manner advanced in the Office action.

Claims 21-32 depend from claim 20 and are submitted to be patentable over the references of record for at least the same reasons as claim 20.

Claim 33

Claim 33 is directed to a mass produced absorbent article comprising an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image including at least one ink having the color of one of cyan, magenta, yellow and black, the image being printed in a non-contact manner on at least a portion of said component by ink jets at a resolution of about 100 dpi with the outer cover moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm), wherein a color difference (DE*) value for any cyan colored ink in the image as compared to a background color of said component on which the image is printed is at least about 6, the DE* value for any magenta colored ink in the image has a color difference (DE*) of

at least about 9, the DE* value for any yellow colored ink in the image has a color difference (DE*) of at least about 8, and the DE* value for any black colored ink in the image has a color difference (DE*) of at least about 6.

Claim 33 is submitted to be non-obvious in view of and patentable over the references of record, and in particular Yeo in view of McFarland et al., for the same reasons set forth above with respect to claim 1. That is, whether considered alone or in combination the references fail to teach or suggest the recited absorbent article wherein the image is printed in a non-contact manner on at least a portion of the component by ink jets at a resolution of about 100 dpi.

Conclusion

In view of the foregoing, favorable consideration and allowance of claims 1-18 and 20-33 is respectfully requested.

The Commissioner is hereby authorized to charge the amount of $450.00 for a second month extension of time in connection with this Response to Final Office action to Deposit Account Number 19-1345 in the name of Senniger Powers.

Respectfully submitted,

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RLB/PEB/tmg
Via EFS